(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 013 579**
B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: 29.12.82

(51) Int. Cl.[3]: B 60 K 15/08, F 17 C 13/04

(21) Application number: 80200004.2

(22) Date of filing: 02.01.80

(54) Head piece for a tank for liquefied gas.

(30) Priority: 03.01.79 BE 192745

(43) Date of publication of application:
23.07.80 Bulletin 80/15

(45) Publication of the grant of the patent:
29.12.82 Bulletin 82/52

(84) Designated Contracting States:
AT BE CH DE FR GB IT LU NL SE

(56) References cited:
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LU - A - 78 272
US - A - 2 449 119
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US - A - 2 609 964
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EP 0 013 579 B1

Courier Press, Leamington Spa, England.

Head piece for a tank for liquefied gas

This invention relates to a head piece for a tank for liquefied gas to be mounted in an enclosed space of a vehicle, between an inlet conduit and an outlet conduit, comprising an over-pressure safety valve, a filling valve with one-way protection, a delivery valve with a flow limiter, and a level meter, which valves are integrated in the head piece and which head piece is adapted to fit at least partly in an opening provided in said tank. Such a head piece has been described in U.S. patent 2,449,119.

When the engine of a vehicle is connected to a so-called L.P.G. tank and this tank or gas cylinder is mounted in for example the luggage compartment of the vehicle, special precautionary measures should be taken to prevent the accumulation of gas in the compartment.

Thus it has already been proposed for the L.P.G. tank or cylinder to be housed in a separate space, or for the cocks or valves that must be provided on such a tank to be mounted in a gas-tight enclosure or cabinet which is in communication with the atmosphere.

The provision of partitions in the luggage compartment is of course a very expensive solution, which from the point of view of safety is a very inadequate one at that. Mounting the valves or cocks in a separate space, such as a gas-tight cabinet will limit security to the resistance of the cabinet proper.

It is an object of the present invention to provide an original solution which provides greater security, as well as a highly compact and block-shaped construction of the head piece according to the invention.

For this purpose said head piece comprises at least a first compartment which communicates through at least one tube to the atmosphere outside said enclosed space, the arrangement being such that the over-pressure safety valve opens into said first compartment, while any leakage from the inlet conduit is collected in said tube, and any leakage from the outlet conduit is collected in said tube which is provided around said outlet conduit, which tube is in turn in communication with said first compartment.

Advantageously, the head piece according to the invention comprises a first cylindrical portion adapted to fit in the opening in the tank, and a second substantially cylindrical portion contiguous with said first cylindrical portion and adapted to be maintained into gas-tight contact with said tank by means of bolts, said second cylindrical portion comprising said first compartment which by means of at least one tube is in communication with the atmosphere outside the enclosed space of the vehicle.

A different solution is provid d in that said first compartm nt is constituted by a cap-shaped cover by means of which the head piece, which consists of said cov r and a housing, can be held in position on the tank or a mounting plate thereof, and to which cover the inlet and outlet conduit and the respective tubes are connected.

In one embodiment of the invention the housing is provided with a flange, said flange having a diameter ranging between those of sealing rings adapted to be provided in recesses of the mounting plate or the tank, the corresponding recess in the cover having a larger diameter, and the space thus formed between said flange and the recess in the cover communicating via a bore with said first compartment.

Other features and advantages of the invention will appear from the following description of some exemplary embodiments of the present invention, with reference to the accompanying drawings. In said drawings,

Fig. 1 is a front-elevational view of a first embodiment of the head piece according to the present invention;

Fig. 2 is a cross-sectional view, taken on the line II—II of Fig. 1;

Fig. 3 is a cross-sectional view, taken on the line III—III of Fig. 1;

Fig. 4 is a plan view of a second embodiment of the head piece according to the invention; and

Figs. 5 and 6 show cross-sectional views, taken on the lines V—V and VI—VI, respectively, of Fig. 4.

Referring to the drawings, the head piece shown is destined to be fixed to the so-called mounting plate of an L.P.G. tank or to the collar around an appropriate opening in said tank.

Before describing the head piece in detail, it is noted that the valves and cocks which may, or must, be provided on an L.P.G. tank or cylinder are at least some of the following:

1. Two one-way valves provided in the inlet conduit for the liquefied gas, and at least one of which is provided in the tank. One of these effects an automatic shut-off, by virtue of which the filling of the tank is limited on a percentage-basis by a float mechanism.

2. A valve which completely shuts off the withdrawal of gas when the engine of the vehicle is stopped.

3. A valve which shuts off the supply of gas in the event of a leak in the output conduit downstream of the head piece.

4. An additional facility which can be reckoned among this equipment is a level meter to be read on the dashboard.

The head piece according to the present invention compris s a purely cylindrical portion 1 which fits in the circular opening 2 of an L.P.G. tank 3 (Fig. 2).

In the embodiment shown in Figs. 1—3, the opening 2 is provided in a so-called mounting

plate of tank 3.

Contiguous with cylindrical portion 1 of the head piece is a portion 4 which through the intermediary of sealing rings 5 and 6 is connect d to the L.P.G. tank in gas-tight relationship. For this purpose, use is made of a number of bolts 7 passing through bores 8 in between the concentric sealing rings 6 and 6 (Fig. 2).

In the portion 4 of the head piece, along the side directed towards a cover plate 17 thereof, there is provided a first compartment 10 which through openings 13 and 14, provided along both sides, and tubes 11 and 12 is in communication with the atmosphere outside the luggage compartment of the vehicle (Fig. 1).

Openings 13 terminate in tube 11, extending up to the wall of the vehicle luggage compartment concentrically around an input conduit 15 to the block, so that gas that would be present in tube 11 from compartment 10 can be discharged to the atmosphere.

Like openings 14 terminate diametrically opposite relative to openings 13 in tube 12, extending concentrically around the gas supply line to the engine, or gas output conduit from block 16.

Compartment 10 is bounded by cover plate 17, mounted by means of bolts 18 provided on the outside of a sealing ring 19.

The head piece, i.e., the first cylindrical portion 1 and 2 and the second, substantially cylindrical portion 4, mounts the above valves. A valve 20 determines the maximum permissible amount of gas in the tank. In practice this is limited to approximately 80% of the capacity of the tank.

Valve 20 has a passage 22 with a valve member 22' that can be closed under the influence of a float mechanism 23, for example, when the liquefied gas reaches a level corresponding to a filling of approximately 80% of the capacity of the tank. Such a valve 20, cooperating with a one-way valve 21, is the subject-matter of Belgian patent specification 871,180 in the name of van Coillie and Mrena.

One-way valve 21 is of course provided upstream of the so-called 80% filling valve 20, and connects direct with a portion 15', bent for structural reasons, of conduit 15.

Additionally provided in the fluid path to the engine is a valve or flow limiter 24, mounted in cylindrical portion 1 downstream of inlet 25, and arranged to be pressed against the action of a spring 26 into contact with a seat 27 under the influence of a sudden rise in dynamic pressure resulting from any downstream tube fracture that may occur.

Accommodated in the same valve body, and co-extensive with flow limiter 24, is a delivery valve constituted by a piston 28, which is held on its seat 30 by a spring 29. At its bottom, piston 28 has a small bore 31, so that the liquid gas can flow through this and through the cavity 28' of a piston 28 to reach the engine through bore 33, a by-pass 34 and conduits 16'—16. However, the passageway to bore 33 only remains op n so long as the small bore 31 remains free, that is to say, so long as coil 48 attracts core 35. Indeed, piston 28 is lifted off its seat 30 owing to the difference in pressure of the liquid upstream and downstream of bore 31.

Core 35 is accommodated in a gas-tight cylindrical cavity 36. A spring 37 pushes core 35 onto seat 33', but when coil 48 is energized core 35 is moved away from its seat 33', so that gas can flow through opening 33 and by-pass 34. Coil 48 is normally energized when the ignition key of the vehicle closes the electric circuit of the engine.

When the coil is not energized and core 35 closes opening 33 under the influence of spring 37 an equilibrium is established between the pressure in cavity 28' and the pressure prevailing upstream of bore 31.

Owing to this condition of equilibrium of the pressure on opposite sides of piston 28, the latter is held on its seat 30 by spring 29. Such a valve is described in the above Belgian patent in the name of van Coillie and Mrena.

Accordingly flow limiter 24 shuts off the supply of gas when, owing to a sudden rise in flow rate resulting from tube fracture, the dynamic pressure keeps valve 24 into contact with seat 27 against the action of the light spring 26. In addition, the supply of gas to the engine through conduit 15 is also closed when the electric circuit of the engine is interrupted by the ignition key.

In addition to the valves described, portion 1 of the head piece further mounts a safety valve 38, which safeguards the gas tank against overpressure. This safety valve is held down onto its seat 40 by a spring 39. Any gas that may be admitted into the valve body will be vented at the side away from the seat into compartment 10, which through openings 13 and 14 and the subsequent tubes 11 and 12 communicates with the atmosphere (Fig. 1).

The cylindrical valve bodies incorporating valves 24—28, on the one hand, and safety valve 38, on the other, are connected at the side away from compartment 10 to a tube 41 terminating on the bottom of the tank, on the one hand, and to a tube 42, terminating in the gas phase, on the other, (Fig. 1).

At the bottom of portion 4, between sealing rings 5 and 6, a second compartment 43 is provided, which through at least one bore 44 communicates with the first compartment 10 (Fig. 2).

Consequently, any gases from the L.P.G. tank itself that would flow away between the portion 1 of the head piece and the mounting plate of the tank in the event of sealing ring 5 having become out of order, will reach said second compartment 43 and, in the manner described, will be carried off to the atmosphere outside the luggage compartment through bore 44 and compartm nt 10.

It follows from the above description that

both gases flowing through the over-pressure safety valve and any l akage from inlet conduit 15 or outlet conduit 16 are collected in compartment 10 and vented through openings 13 and 14 and tube 11 or 12 to th atmosphere.

Finally the head piece comprises a level meter 45, which in cooperation with so-called reed-relays 46, makes the liquid level in the tank readable on lamps 47. Naturally a different kind of level meter may be employed.

In the embodiment illustrated in Figs. 4—6, use is made of a mounting plate 51 welded to th wall 50 of a tank. The housing 53 of a head piece is received in an opening 52 of mounting plate 51, and secured therein possibly with screws. This housing is provided at the top with a cover 54, bolted to it, to which a conduit 55 is connected, which conduit communicates with the atmosphere. At its bottom, the housing has a closure plate 56.

Mounted in the head piece, i.e. housing 53, in a bore 58 is a safety valve 57 provided with a resilient sealing ring 59 arranged to cooperate with a seat 60. Seat 60 surrounds a bore 61 communicating with the gaseous phase of the tank. Valve 57 is loaded by a spring 62 supported on a ring 63 mounted in bore 58 in an adjustable manner. The operation of this safety valve will be clear: when the pressure in the tank exceeds a given value, valve 57 will be lifted off its seat 60 against the action of spring 62, which enables gas to escape via bore 61, openings 64 in the valve, bore 58 to cover 54 and thence through conduit 55 to the atmosphere.

Housing 53 further comprises a filling-valve structure, the principle and operation of which is known except for the float construction. This float construction comprises a float 65 secured to a lever 66 pivoted to a supporting member 67 formed on closure plate 56. A pin 68 connected to lever 66 operates a spring-loaded ball 69 arranged to cooperate with a seat 70. As soon as the level in the tank has reached a given position, the float will begin to float, and the spring-loaded ball 69 will be forced onto its seat 70, thereby shutting off compartment 71 from the interior of the tank. As a consequence, the spring-loaded first sealing valve 72 and the second sealing valve 73 will be forced towards their seat 74, whereby the connection between the supply conduit 75 and outlet opening(s) 76 is closed. Supply conduit 75 terminates in a coupling member 77, to which a flexible tube can be connected, which through conduit 55 can be passed outside the vehicle.

Housing 53 of the head piece (see Fig. 6) is further provided with an outlet to the engine. For this purpose a conduit 78 extending to the bottom of the tank connects with the bottom of the housing via closure plate 56. Conduit 78 terminates in the housing in a valve body 79 mounting a valve or flow limiter 81, provided with guide lugs, and loaded by a spring 80. This valve is arranged to seal on a seat 82 provided around an opening 83 in valve body 79. Th other end of opening 83 is also provided with a seat 84, with which a delivery valve 85, loaded by a spring 103 can cooperate. Valve 85 is further provided with a bore 86 and with a seat ring 87. Valve 85 is accommodated in a bore 88 to which two passages 89 and 90 connect, which passages lead to the engine via a connecting nipple 91. Passage 90 leads direct to nipple 91, but passage 89 terminates in a compartment 92 accommodating a ball 93 loaded by a spring 95, and to which is further connected a passage 94 leading to nipple 91. Extending into the top of compartment 92 is further the lower end of a core 96 arranged to be energized by an electric magnet 97.

The operation of this "outlet" to the engine is as follows.

When the electric circuit of the engine is closed, the coil will energize the core, and ball 93 will open the passage to nipple 91. Under the influence of the gas pressure (liquid) gas will now flow from the tank through conduit 78, flow limiter 81, opening 83 and passage 90 to nipple 91. Also through bore 86, bore 88, passage 89, compartment 92 and passage 94, liquid gas will flow to the connecting nipple 91. If the electric circuit of the engine is broken, ball 93 will close passage 94, whereby the pressure above and below delivery valve 85 will be equalized: owing to spring 103 the valve will now be forced onto its seat 84, whereby passage 90 will be closed too.

It is noted that spring 95, by means of which ball 93 is forced down, is adjustable by means of a plug 98.

As shown in the drawings (Fig. 4), the other end of nipple 91 opens into a conduit 99 also passing to the atmosphere. A flexible conduit extending to the engine can be connected to nipple 91.

As illustrated further in Figs. 5 and 6, in order to ensure a gas-tight seal between the cover and the mounting plate 51, plate 51 is equipped with two recesses accommodating sealing rings 100 and 101. The space between sealing rings 110 and 101 is in communication with conduit 55 through the annular slot between the flange of housing 53 and the cover wall and a bore 102. By virtue of this construction any leakage gas is also carried off direct to the atmosphere through conduit 55.

Naturally, parts of the two embodiments shown and described may be interchanged, if necessary with some adaptation.

Furthermore, many modifications will readily occur to those skilled in the art without departing from the scope of the invention. Thus, additional valves may be incorporated in the inlet and outlet ducts leading to and from the head piece. Furthermor , for example, a venting valve may be mounted in the head piece, by means of which the tank can be vented during filling (in particular when it is filled for the first

time).

Claims

1. A head pi ce for a tank for liqu fied gas to be mounted in an enclosed space of a vehicle between an inlet conduit and an outlet conduit, and comprising an overpressure safety valve, a filling valve with one-way protection, a delivery valve with a flow limiter, and a level meter which valves are integrated in the head piece and which head piece is adapted to fit at least partly in an opening provided in said tank, characterized in that said head piece comprises at least a first compartment (10; 54) communicating through at least one tube (11; 55) with the atmosphere outside said enclosed space, the arrangement being such that the overpressure safety valve (38; 57) opens into said first compartment, while any leakage from the inlet conduit is collected in said tube, and leakage in the outlet conduit is collected in said tube (11; 58) which is provided around said outlet conduit, said tube being in turn in communication with said first compartment.

2. A head piece as claimed in claim 1, characterized in that it comprises a first cylindrical portion (1; 53) adapted to fit in the opening of said tank (3; 50) and a second, substantially cylindrical portion (4) contiguous with said first cylindrical portion and adapted to be maintained into gas-tight contact with said tank by means of bolts (7), said second portion comprising said first compartment (10; 54) communicating through at least one tube (11; 55) with the atmosphere outside the enclosed space of the vehicle.

3. A head piece as claimed in claim 2, wherein said bolts (7) pass through bores (8) terminating between two concentric sealing rings (5, 6) adapted to be pressed down on the tank wall (3), which sealing rings define a second compartment (43) in said head piece.

4. A head piece as claimed in either of claims 2 and 3, wherein said bores (8) terminate on one side in said second compartment (43) and on the other side in said first compartment (10).

5. A head piece as claimed in any one of claims 2, 3 and 4, wherein, in addition, at least one bore (44) connects said first and second compartments (10 and 43).

6. A head piece as claimed in any of claims 1—5, wherein said first compartment (10) is bounded on one side by a closure plate (17) substantially coinciding with one wall of the head piece.

7. A head piece as claimed in either of claims 1 and 2, wherein said first compartment is formed by a cap-shaped cover (54), by means of which cover the head piece consisting of a housing (53) and the cover (54) can be held in positi n in full or in part, on the tank (50) or a mounting plate (51) thereof, and to which cover the inl t and outlet conduits (15 and 16; 77 and 91) and the tubes (11 and 12; 55 and 99) are c nn cted.

8. A head piece as claimed in claim 7, wherein th housing (53) comprises a flange having a diameter intermediate those of sealing rings (100 and 101) adapted to be provided in recesses of the mounting plate (51) or the tank (50), and the corresponding cover recess has a larger diameter, the compartment thus formed between said flange and said recess communicating through a bore (102) with said first compartment.

Revendications

1. Terminaison d'un réservoir à gaz liquéfié, prévu pour être monté dans un espace fermé dans un véhicule entre un conduit d'entrée et un conduit de sortie et comprenant une valve de sûreté à surpression, une valve de remplissage avec dispositif de non retour, une valve d'évacuation avec un limiteur de débit et un indicateur mesureur de niveau, ces valves étant incorporées dans la terminaison, laquelle est adaptée à être montée, au moins en partie, dans une ouverture ménagée dans ledit réservoir, ladite terminaison étant caractérisée en ce qu'elle comprend au moins un premier compartiment (10; 54) communiquant par au moins un tube (11; 55) avec l'atmosphère à l'extérieur dudit espace fermé, la disposition étant telle que la valve de sûreté à surpression (38; 57) débouche dans ledit premier compartiment, tandis que toute fuite venant du conduit d'entrée (15) est recueillie dans ledit tube et que toute fuite du conduit de sortie (16) est recueillie dans ledit tube (11; 55) qui est prévu autour dudit conduit de sortie, ce tube étant à son tour en communication avec ledit premier compartiment.

2. Terminaison selon la revendication 1, caractérisée en ce qu'elle comprend une première partie cylindrique (1; 53) adaptée à être montée dans l'ouverture dudit réservoir (3; 50) et une deuxième partie (4) pratiquement cylindrique, adjacente à ladite première partie cylindrique et adaptée à être maintenue en contact étanche au gaz avec ledit réservoir au moyen de boulons (7), ladite deuxième partie comprenant ledit premier compartiment (10; 54) communiquant par au moins un tube (11; 55) avec l'atmosphère à l'extérieur de l'espace fermé du véhicule.

3. Terminaison selon la revendication 2, caractérisée en ce que lesdits boulons (7) passent par des perçages (8) se terminant entre deux bagues d'étanchéité concentriques (5; 6), adaptées à être serties dans la paroi du réservoir (3), les bagues d'étanchéité définissant un deuxième compartiment (43) dans ladite t rminaison.

4. Terminaison selon l'une des revendications 2 ou 3, caractérisée en ce que lesdits perçages (8) se terminent d'un côté dans ledit deuxième comp rtiment (43) et de l'autre côté dans ledit premier compartiment (10).

5. Terminaison s lon l'une des revendications 2, 3 ou 4, caractérisée en ce qu'en outre au moins un perçage (44) relie lesdits premier et d uxième compartiments (10 et 43).

6. T rminaison selon l'une des r vendications 1 à 5, caractérisée en ce que ledit premier compartiment (10) est limité d'un côté par une plaque de fermeture (17) coïncidant pratiquement avec une paroi de la terminaison.

7. Terminaison selon l'une des revendications 1 ou 2, caractérisée en ce que ledit premier compartiment est formé par un couvercle en forme de coiffe (54) au moyen duquel la terminaison constituée par un corps enveloppe (53) et le couvercle (54) peut être maintenue en place complètement ou en partie sur le réservoir (50) ou sur une plaque support (51) appartenant à celui-ci, les conduits d'entrée et de sortie (15 et 16; 77 et 91) et les tubes (11 et 12; 55 et 99) étant reliés audit couvercle.

8. Terminaison selon la revendication 7, caractérisée en ce que le corps enveloppe (53) comprend une collerette ayant un diamètre intermédiaire entre ceux des bagues d'étanchéité (100 et 101), adaptées à être établies dans des évidements de la plaque support (51) ou du réservoir (50) et en ce que l'évidement de couvercle correspondant présente un plus grand diamètre, le compartiment ainsi formé entre ladite collerette et ledit évidement communiquant par l'intermédiaire d'un trou (102) avec ledit premier compartiment.

Patentansprüche

1. Kopfstück für einen in einem geschlossenen Fahrzeugraum zwischen einer Einlaß- und einer Auslaßleitung angeordneten Flüssigkeitstank mit einem Überdruck-Sicherh itsventil, einem Füllventil mit Rückschlagschutz, einem Abgabeventil mit Strömungsbegrenzer und einem Füllstandsmesser, bei dem die Ventile in das Kopfstück integriert sind sowie das Kopfstück für dessen teilweise Aufnahme in einer in dem Tank vorgesehenen Öffnung vorgesehen ist, dadurch gekennzeichnet, daß das Kopfstück zumindest einen ersten über mindestens eine Röhre (11; 55) mit der Atmosphäre außerhalb des geschlossenen Fahrzeugraumes in Verbindung stehenden Raum (10; 54) in einer solchen Anordnung aufweist, daß das Überdrucksicherheitsventil (38; 57) in den ersten Raum mündet, jegliche Leckmengen aus der Einlaßleitung in der Röhre gesammelt werden, Leckmengen in der Auslaßleitung in um die Auslaßleitung herum sich erstreckende Röhre (11; 55) gesammelt werden und diese Röhre and rerseits mit dem ersten Raum in Verbindung steht.

2. Kopfstück nach Anspruch 1, gekennzeichnet durch einen ersten zylindrischen Bereich (1; 53) zur Aufnahme in der Öffnung (3; 50) des Tankes sowie einen an den ersten zylindrischen Bereich sich anschließenden mittels Bolzen (7) in gasdichtem Kontakt mit dem Tank stehenden, den ersten Raum (10; 54) enthaltenden sowie über mindestens eine Röhre (10; 55) mit der Atmosphäre außerhalb des geschlossenen Fahrzeugraumes in Verbindung stehenden zweiten, im wesentlichen zylindrischen Bereich (4).

3. Kopfstück nach Anspruch 2, dadurch gekennzeichnet, daß die Bolzen (7) zwischen zwei, gegen die Tankwandung (3) preßbaren, konzentrischen Dichtungsringen (5, 6) endende Bohrungen (8) durchgreifen und die Dichtungsringe in dem Kopfstück einen zweiten Raum (43) bilden.

4. Kopfstück nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß die Bohrungen (8) einerseits in dem zweiten Raum (43) und andererseits in dem ersten Raum (10) münden.

5. Kopfstück nach einem der Ansprüche 2 bis 4, gekennzeichnet durch mindestens eine den ersten und zweiten Raum (10 und 43) verbindende Bohrung (44).

6. Kopfstück nach einem oder mehreren der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß der erste Raum (10) einseitig mit einer im wesentlichen mit einer Wand des Kopfstückes zusammenfallenden Abdeckplatte (17) abgeschlossen ist.

7. Kopfstück nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der erste Raum aus einem kappenartigen, mit einem Gehäuse (53) das Kopfstück gemeinsam bildenden und das Kopfstück ganz oder teilweise auf dem Tank (50) oder dessen Montageplatte (51) in Position haltenden sowei mit den Einlaß- und Auslaßleitungen (15 und 16; 77 und 91) und den Röhren (11 und 12; 55 und 99) verbundenen Deckel (54) besteht.

8. Kopfstück nach Anspruch 7, dadurch gekennzeichnet, daß das Gehäuse (53) einen Flansch mit einem Durchmesser zwischen denen der in Ausnehmungen der Montageplatte (51) oder des Tankes vorgesehenen Dichtungsringen (100, 101) aufweist, eine entsprechende Ausnehmung des Deckels einen größeren Durchmesser aufweist und der so zwischen dem Flansch und der Ausnehmung gebildete Raum über eine Bohrung (102) mit dem ersten Raum in Verbindung steht.

FIG.1

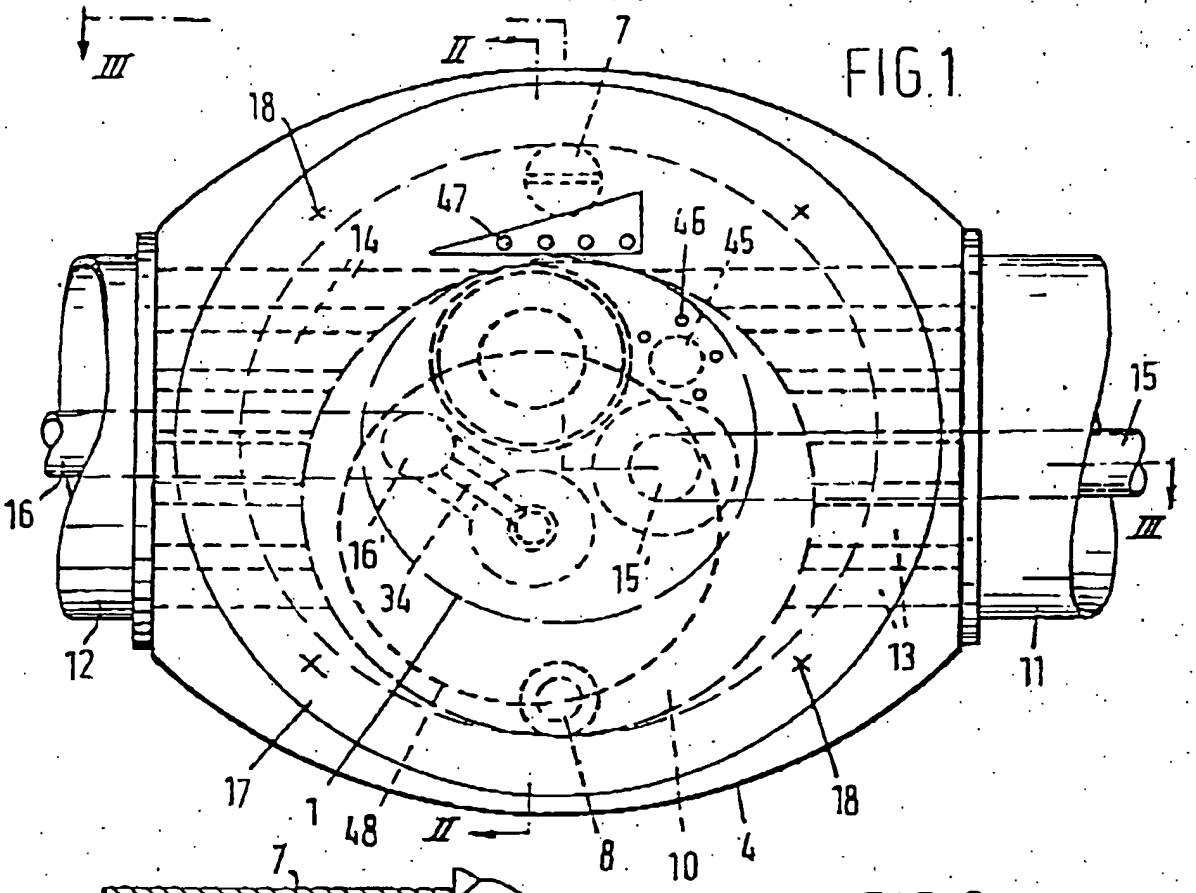
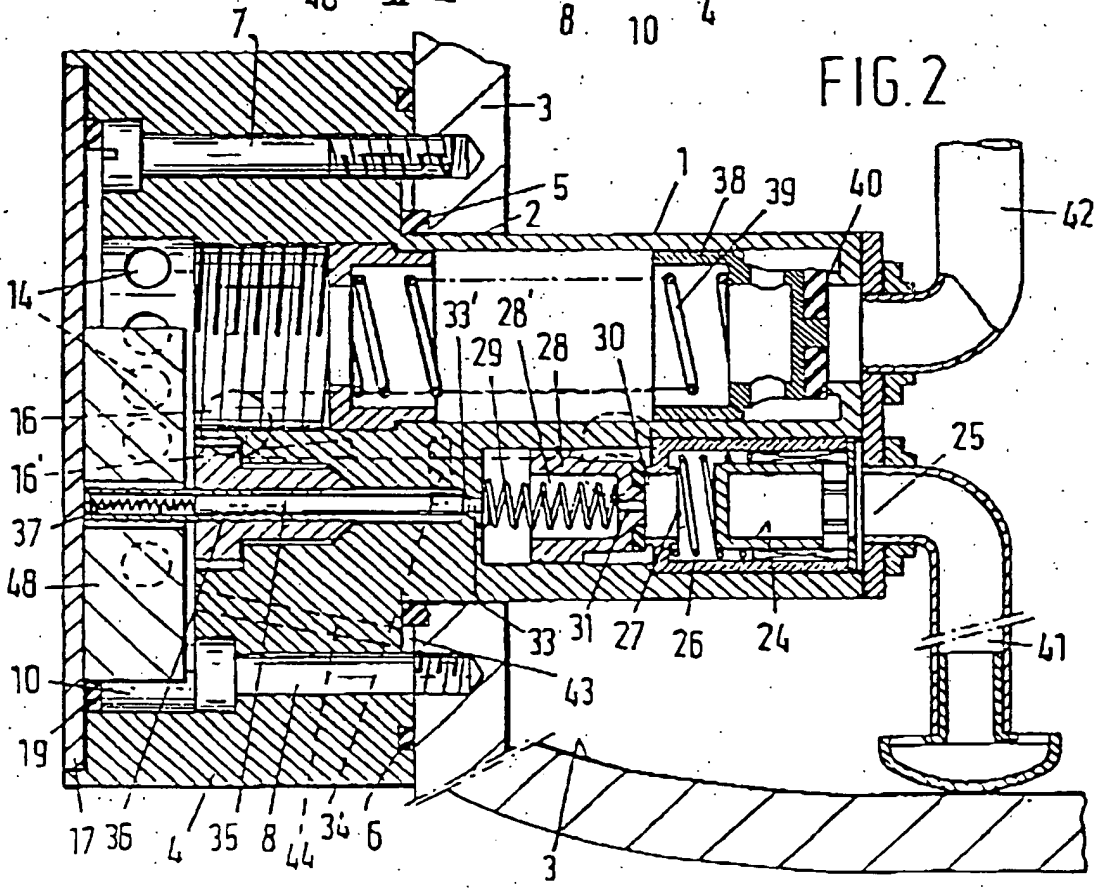

III
II
7
18
47
46
45
14
15
16
16'
34
15
III
12
13
11
17
1
48
II
8
10
4
18

FIG.2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38
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34
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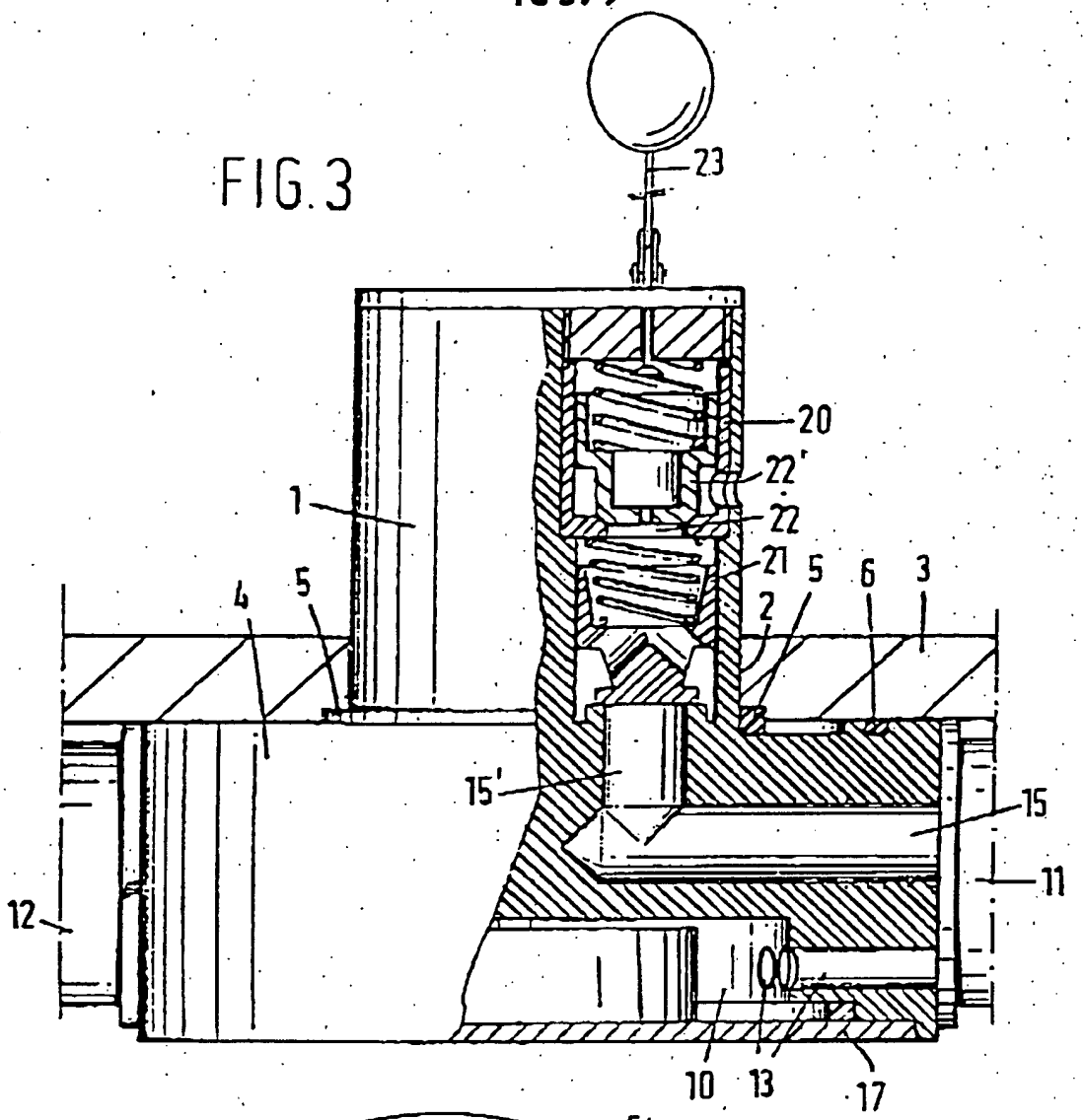
3

FIG.3



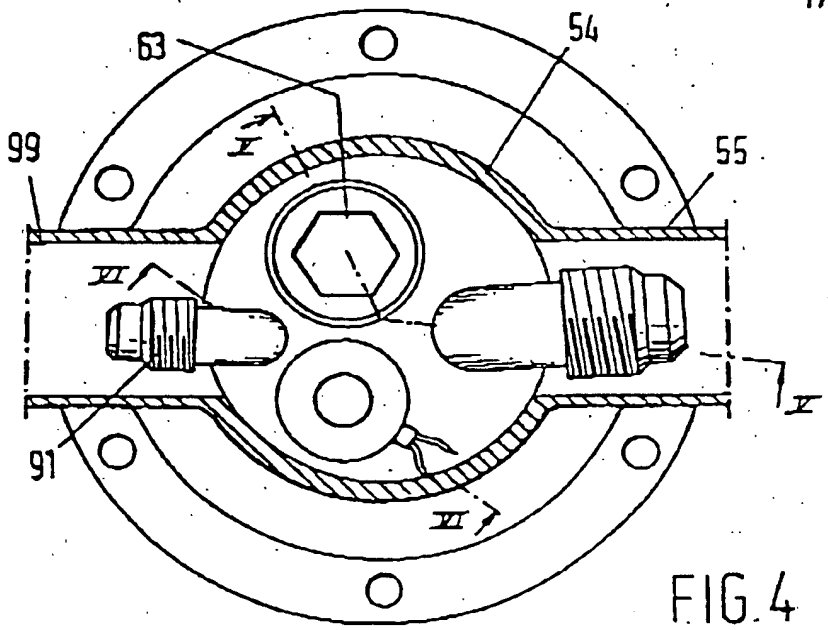
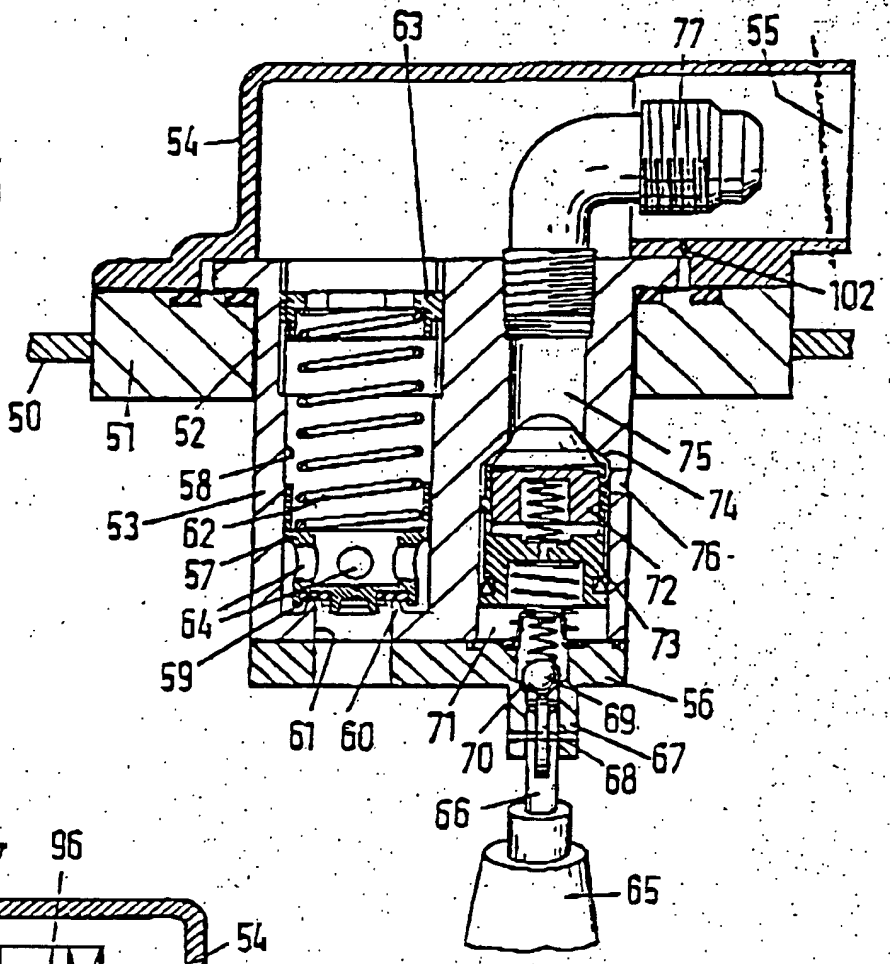


FIG.4

FIG.5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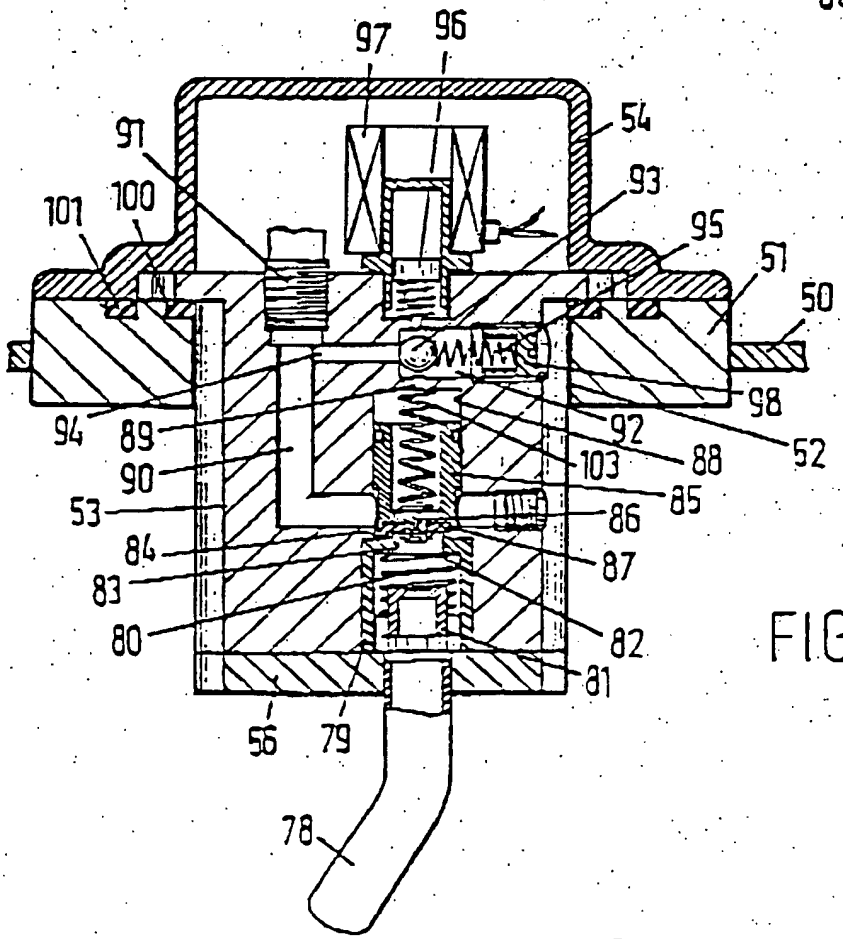
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FIG.6